2022 [illegible] 6 [illegible]

[illegible]

[illegible] 7 [illegible] 100 [illegible] 90 [illegible]

[illegible]

1.[illegible]

2.[illegible]“[illegible]”[illegible]

3.[illegible] 2B [illegible]

[illegible]

4.[illegible] g [illegible] $10m/s^2$.

[illegible]

[illegible]I[illegible] 13 [illegible] 3 [illegible] 39 [illegible]

[illegible]

1. [illegible]

A. $kg\cdot m/s^2$ B. $kg\cdot m/s$ C. $kg\cdot m^2 s$ D. $kg\cdot s/m^2$

[illegible]A

[illegible]

[illegible]

$$F = ma$$

[illegible]

$$kg\cdot m/s^2$$

[illegible] A[illegible]

2. [illegible]

A. [illegible]

B [illegible]

C. [illegible]

D. [illegible]

□□□□B

□□□□

□□□□A□□□□□□□□□□□□□□□□□□□□□□A □□□

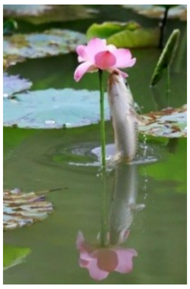
B□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□B □□□

C□□□□□□□□□□□□□□□□□□□□□□□□□□□□□C □□□

D□□□□□□□□□□□□□□□□□□□□□□□□□□D □□□

□□ B□

3. □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□



A. □□□□□□□□□□□□□

B. □□□□□□□□□□□□□

C. □□□□□□□□□□□□□□

D. □□□□□□□□□□□□□□□□□□□□□□□□

□□□□C

□□□□

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BC□□□B □□□C □□□

D□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□D □□□

□□ C□

4. □□□□□□□□□□□□□□□□□□□□

A. □□□□□□□□□□□□

B. □□□□□□□□□□□□□□□□□□□

C. □□□□□□□□□□□□□□□□□□□□

D. □□□□□□□□□□□□□□

□□□□B

□□□□

□□□□A□□□□□□□□□□□□□□□A □□□

B□□□□□□□□□□□□□□□□□□□□□□□□□□□□B □□□

C□□□□□ $\Delta x=\frac{L}{d}\lambda$ □□□□□□□□□□□□□□ L□□□□□□□□□□□□□□□□□□□□□□□□C □□□

D□□□□□ $\Delta x=\frac{L}{d}\lambda$ □□□ $\lambda_{□}<\lambda_{□}$□□□□□□□□□□□□□□□□□D □□□

□□ B□

5. □□□□□□□□□□

A. □□□□□□□□□□□□□□□□□□

B. □□□ N □□□□□□□□□□□□□□□□□□□□□

C. □□□□□□□□□□□□□□□□□□□□□□□□□□□□□

D. □□□□□□□□□□□□□□□□□□□□□□□□□□□□□

□□□□B

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B□□□□ N □□□□□□□□□□□□□□□□□□□□□□B □□□

C□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ 0□C □□□

D□□D □□□

□□ B□

6. □□□□□□□□□“□□□□□□”□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ □

A. □□□□□□□□□□□□□□□□□□□□□□□□□

B. □□□□□□□□□□□□□□□□□□□□□□

C. □□□□□□□□□□□□□□□□□□□□□□□

D. □□□□□□□□□□□□□□□□□□□□□

□□□□C

□□□□

□□□□AC□□□

$$G\frac{Mm}{r^2}=m\frac{v^2}{r}$$

□□

$$v=\sqrt{\frac{GM}{r}}$$

[illegible]A [illegible]C [illegible]

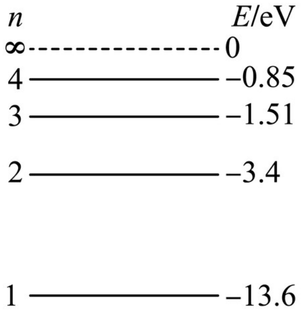
B[illegible]B [illegible]

D[illegible]D [illegible]

[illegible]C[illegible]

7. [illegible]n=3 [illegible]2.29eV [illegible]

[illegible]（　　）



A. [illegible]10.80eV

B. n=3 [illegible]n=1 [illegible]

C. [illegible]3 [illegible]

D. [illegible]0.85eV [illegible]n=4 [illegible]

[illegible]B

[illegible]

[illegible]A[illegible]n=3 [illegible]n=1 [illegible]

$$E_k=E-W_0$$

[illegible]

$$E_k=9.8\text{eV}$$

[illegible]A [illegible]

B[illegible]

$$p=\frac{h}{\lambda}=\frac{h\nu}{c}$$

$$E=h\nu$$

□□□□ n=3 □□□ n=1 □□　□□□□□□□□□□□□□□□□□ B □□□

C□□□□□□□ n=3 □□□□□□□□□□□□ $C_3^2=3$ □□□□□□□□□□□ n=3 □□□ n=2 □□□□□□□□

$$\Delta E_k' = 3.4\text{eV} - 1.51\text{eV} = 1.89\text{eV} < 2.29\text{eV}$$

□□□□□□□□□□□□□□□□□□□□□□□□□ C □□□

D□□□□ n=3 □□□ n=4 □□□□□□□□□□□□□

$$\Delta E = 1.51\text{eV} - 0.85\text{eV} = 0.66\text{eV} \neq 0.85\text{eV}$$

□□□ 0.85eV □□□□□□□□□□□□□□□□ n=4 □□□□□ D □□□

□□ B□

8. □□□

□□□□（　　）

A. □□□□□□□□□□□□□

B. □□□□□□□□□□“□□”

C. □□□□□□□□□□□□

D. □□□□□□□□□□“□□”

【□□】C

【□□】

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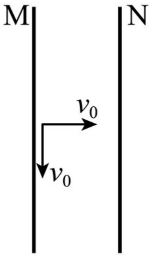
□□□□□□□□□□□□□□□□

□□ C□

9. □□□□□□□□□□□□□□□□□□□□□□□□ M□N □□□□□□□□□□□□ L□□□□□□□□□□ t=0 □□□M □□□□□□□

□□□□□□□□□□□ v_0 □□□□□□□□ M □□□□□□□□□ N □□□□□□□ $\sqrt{2}v_0$ □□□ M □□□□□□□□□□□ N □□□

□□□□□□□□□□□□□□□□□□□□□（　　）



A. M [illegible] N [illegible]

B. [illegible]

C. [illegible] $a=\frac{2v_0^2}{L}$

D. [illegible] N [illegible] $t=\frac{(\sqrt{2}-1)L}{2v_0}$

[illegible]C

[illegible]

[illegible]A[illegible] M [illegible] N [illegible] A [illegible]

B[illegible] M [illegible] N [illegible] M [illegible] N [illegible]

[illegible] B [illegible]

CD[illegible] d[illegible] M [illegible] N [illegible]

$$\frac{L}{2}=v_0t$$

$$d=\frac{1}{2}at^2$$

[illegible] M [illegible]

$$\left(\sqrt{2}v_0\right)^2-v_0^2=2ad$$

[illegible]

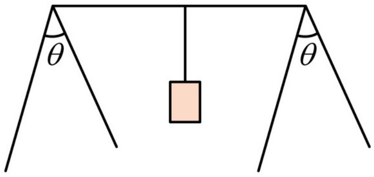
$$t=\frac{L}{2v_0}\text{，}a=\frac{2v_0^2}{L}$$

[illegible] C [illegible]D [illegible]

[illegible] C[illegible]

10. [illegible] $\theta=60^{\circ}$。[illegible] G [illegible]

[illegible]（　　）



A. [illegible] $\frac{\sqrt{3}}{3}G$

B. [illegible] $\frac{\sqrt{3}}{6}G$

C. [illegible] $\frac{\sqrt{3}}{4}G$

D. [illegible] $\frac{\sqrt{3}}{8}G$

[illegible]B

[illegible]

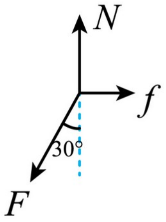
[illegible] F [illegible]

$$4F\cos 30^{\circ}=G$$

[illegible]

$$F=\frac{\sqrt{3}}{6}G$$

[illegible]



[illegible] F [illegible] $\frac{\sqrt{3}}{6}G$ [illegible]

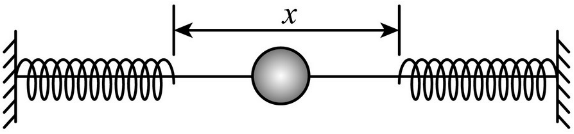
$$f=F\sin 30^{\circ}=\frac{\sqrt{3}}{12}G$$

B [illegible]ACD [illegible]

[illegible] B。

11. [illegible] x [illegible] v [illegible]

□□□□□□□□□□ T □□□□□□□□　　□



A. □□□□□□□

B. □□□□　□□□□□ $\frac{T}{2}$

C. □□□□□□□□□□□□□□ T

D. □□□□□□ $\frac{V}{2}$ □□□□□□□ $2T$

□□□B

□□□□

□□□A□□

□□□□□□□□□□□□□□□□□□□□□□□A □□

BC□□□□□□ O □□□□□□□□□□□□□□□□□□ A □□□□□□□□□□□□□□□□□□ B □□□□□□□□ T

□□□□□□□

$$O\to A\to O\to B\to O$$

□□□□□□□□□ $O\to A\to O$ □ $O\to B\to O$ □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

□□□□□□□□□ $\frac{T}{2}$ □□□□□□□□□□□□□□□ $\frac{T}{2}$ □B □□□C □□

D□□□□□□□ $\frac{V}{2}$ □□□□□□□□□□□□□□□□□ 2 □□□□□□□□□□□□□□□□□

$$T_0 = 2\pi\sqrt{\frac{m}{k}}$$

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□□B□

12. □□□□□□□□□“□□”□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

$9\mathrm{m/s}$□□□□□□$405\mathrm{kW}$□□□$5\sim10\mathrm{m/s}$□□□□□□□□□□□□□□□□□□□□□□A□□□

□□ρ□□□□□v□□□□□□□□□□□□□□□□（　　）

A. □□□□□□□□□□□□□□

B. □□□□□□A□□□□□□$\frac{1}{2}\rho Av^2$

C. □□□□□$1.0\times10^8\mathrm{kW}$□□□□□□□□□□$2.4\times10^9\mathrm{kW\cdot h}$

D. □□□□□$5000\mathrm{h}$□□$6\sim10\mathrm{m/s}$□□□□□□□□□□□□□□$6.0\times10^5\mathrm{kW\cdot h}$

□□□D

□□□

□□□AB□□□□□□□A□□□□□□

$$V_0=Av$$

□□□□□□A□□□□□□

$$m_0=\rho V_0=\rho Av$$

□□□□□□A□□□□□□

$$\frac{1}{2}m_0v^2=\frac{1}{2}\rho Av^3$$

□□$5\sim10\mathrm{m/s}$□□□□□□□□□□□□□□□□□ □□□□□□□□□□□□AB□□

C□□□□□□□□□□□□□□□$1.0\times10^8\mathrm{kW}$□□□□□□□□□□□

$$E<1.0\times10^8\times24\mathrm{kW\cdot h}=2.4\times10^9\mathrm{kW\cdot h}$$

C □□□

D□□□□□□□5000h□□□$6\sim10\text{m/s}$□□□□□□□□□□□□□6m/s□□□□□□□□□□□□□□□□□□□□□□

□□9m/s□□□□□□□□405kW□□□□$5\sim10\text{m/s}$□□□□□□□□□□□□□□□□□□□6m/s□□□□□□□□

$$P=6^3\times\frac{405}{9^3}\text{kW}=120\text{kW}$$

□□□□□□□□□□□□

$$E=Pt=120\times5000\text{kW}\cdot\text{h}=6.0\times10^5\text{kW}\cdot\text{h}$$

D □□□

□□ D□

13. □□□□□□□□1200W□□□□□□300N□□□□□□□□□□□□□□□□20kg□□□□□□□□□□85.2m□

□□□□□□□□□□□□□□□□□□□□□5m/s^2□□□□□□□□□□□□□□□□□□g□10m/s^2□□□□□□□□□□□□

□　　□

A. 13.2s　　B. 14.2s　　C. 15.5s　　D. 17.0s

□□□□C

□□□□

□□

□□□

$$a_1=\frac{T_{\text{m}}-mg}{m}=\frac{300-20\times10}{20}\text{m/s}^2=5\text{m/s}^2$$

□□□□□□□□□□□□□□ □□□v_1□□□

$$v_1=\frac{P_{□}}{T_{\text{m}}}=\frac{1200}{300}\text{m/s}=4\text{m/s}$$

□□□□□□□□□□□□□□□

$$t_1=\frac{v_1}{a_1}=\frac{4}{5}\text{s}=0.8\text{s}$$

$$h_1=\frac{v_1^2}{2a_1}=\frac{4^2}{2\times5}\text{m}=1.6\text{m}$$

[illegible]

$$v_m=\frac{P_{[illegible]}}{T}=\frac{P_{[illegible]}}{mg}=\frac{1200}{200}\text{m/s}=6\text{m/s}$$

[illegible]

$$t_3=\frac{v_m}{a_m}=\frac{6}{5}\text{s}=1.2\text{s}$$

$$h_3=\frac{v_m^2}{2a_m}=\frac{6^2}{2\times5}\text{m}=3.6\text{m}$$

[illegible] t_2 [illegible]

$$P_{[illegible]}t_2-mgh_2=\frac{1}{2}mv_m^2-\frac{1}{2}mv_1^2$$

[illegible]

$$h_2=85.2\text{m}-1.6\text{m}-3.6\text{m}=80\text{m}$$

[illegible]

$$t_2=13.5\text{s}$$

[illegible]

$$t_{min}=t_1+t_2+t_3=0.8\text{s}+13.5\text{s}+1.2\text{s}=15.5\text{s}$$

C [illegible]ABD [illegible]

[illegible]C[illegible]

[illegible]II[illegible]3[illegible]2[illegible]6[illegible]2[illegible]1[illegible]0[illegible]

14. [illegible] $^{14}_{6}C$ [illegible] $^{14}_{7}N+^{1}_{0}n\rightarrow\ ^{14}_{6}C+X$ [illegible] $^{14}_{6}C$ [illegible] $^{14}_{6}C\rightarrow\ ^{14}_{7}N+^{0}_{-1}e$ [illegible]

[illegible]（　　）

A. X [illegible] $^{1}_{1}H$

B. $^{14}_{6}C$ [illegible]

C. $^{0}_{-1}e$ [illegible]

D. [illegible] 10 [illegible] $^{14}_{6}C$ [illegible] 5 [illegible]

[illegible] AB

[illegible]

[illegible] A [illegible] X [illegible] 1 [illegible] 1 [illegible] $^{1}_{1}H$ [illegible] A [illegible]

B [illegible] $^{14}_{6}C$ [illegible] $^{16}_{8}O$ [illegible] $^{3}_{1}H$ [illegible] B [illegible]

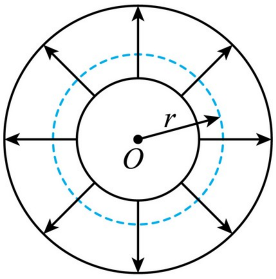
C [illegible] $^{0}_{-1}e$ [illegible] $^{0}_{-1}e$ [illegible] C [illegible]

D [illegible] D [illegible]

[illegible] AB [illegible]

15. [illegible] $E=\frac{a}{r}$ [illegible] a [illegible] r [illegible]

[illegible] (　　) [illegible]



A. [illegible] r [illegible]

B. [illegible]

C. [illegible] r [illegible]

D. [illegible]

[illegible] BC

[illegible]

[illegible] A [illegible]

$$\frac{a}{r}\cdot q=m\omega^2 r$$

□□

$$\omega=\sqrt{\frac{aq}{m}}\cdot\frac{1}{r}$$

□□□□□□r□□□□□□□□□□A□□□

BC□□□□□□□□□□□□□

$$\frac{a}{r}\cdot q=m\frac{v^2}{r}$$

□□

$$v=\sqrt{\frac{aq}{m}}$$

□

$$E_k=\frac{1}{2}mv^2$$

□□□□

$$E_k=\frac{aq}{2}$$

□□□□□□□□□□□□□□□□□□□□□□□□□□□□r□□□□□□BC□□□

D□□D□

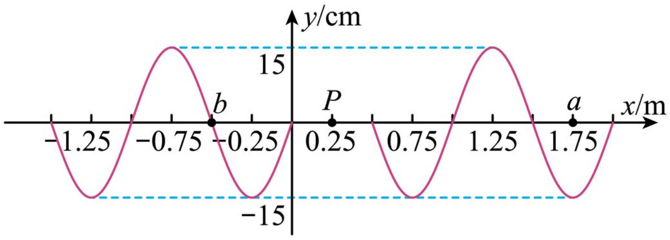
□□

□□BC□

16. □□$x=0.25\text{m}$□□□P□$t=0$□□□□□□□□□□□□□□□x□□□□□□□□□$t=2.0\text{s}$□□□□□□□□

$t=2.1\text{s}$□□□□□□□□□□□□□□□a□□□□□$x_a=1.75\text{m}$□□□b□□□□□$x_b=-0.5\text{m}$□□□□□□□□□□

□



A. □ x □□□□□□□□□□□□□

B. $t=0.42\mathrm{s}$ □□□□□□□□□

C. $t=2.25\mathrm{s}$ □□□□ a □ y □□□□□□

D. □ 0 □ 2s □□□□ b □□□□□□ 2.55m

□□□□BD

□□□□

□□□□A□□□□□□□□□□ x □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ A □□□

B□□□□□□□□□□

$$\lambda=1\mathrm{m}$$

□□□□□ 0.1s □□□□□□□□□□□□□

$$\frac{T}{4}=0.1\mathrm{s}$$

□□

$$T=0.4\mathrm{s}$$

□□□□□□□□□□□□□□□□□□ $t=0.42\mathrm{s}$ □ $T<t<\frac{5T}{4}$ □□□□□□□□□□□□□□□ B □□□

C□□□□□

$$v=\frac{\lambda}{T}=2.5\mathrm{m/s}$$

□□□□□□□□□□ a □□□□□□□

$$t_1=\frac{1.75-0.25}{2.5}\mathrm{s}=0.6\mathrm{s}>0.25\mathrm{s}$$

□□□ a □□□□□□□ $t=2.1\mathrm{s}$ □ $t=2.25\mathrm{s}$ □□□□ $t_2=0.15\mathrm{s}$ □ $\frac{T}{4}<t_2<\frac{T}{2}$ □□□□□□□□□ a □□□□□□ y

□□□□□□□□ C □□□

D□□□□ b □□□□□□

$$t_3=\frac{0.75}{2.5}\mathrm{s}=0.3\mathrm{s}$$

□0□2s□□□□ b □□□□□

$$t_4 = 2s - 0.3s = 1.7s = \frac{17}{4}T$$

□□ b □□□□□

$$s = 17A = 17\times 0.15m = 2.25m$$

□D□□□

□□BD□

□□□□□□

□□□□□□□□□□6□□□□55□□

17. □1□①“□□□□□□□□□□□□□□□□”□□□□□1□□□□□□□□□□□□□□□□□□□□□□□2□□□□□□□□□□□□ O □□□□□□□□□□□□□□□□□□□□□ B □□□□□□□□______cm□□□3□□□□□□□□□□□□□□□□□□______m/s^2□□□□□□□□□□□

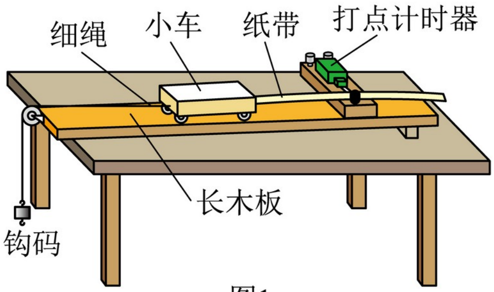


图1

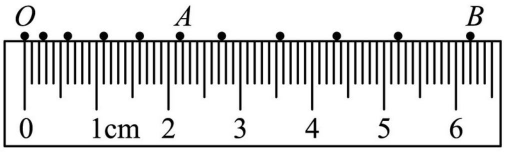


图2

□□□1□□“□□□□□□□□□□□□□□”□□□□□□□□□______□

A□□□□□□□□□　　B□□□□□□□□□□□

C□□□□□□□□□□□□□□　　D□□□□□□□□□□□□□□□□□□□

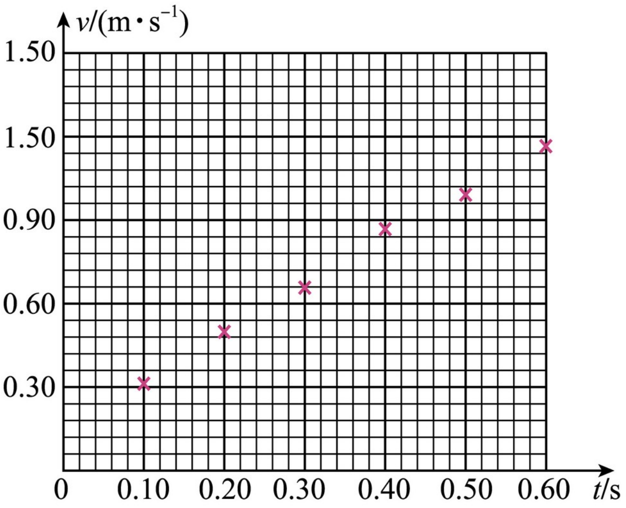


图3

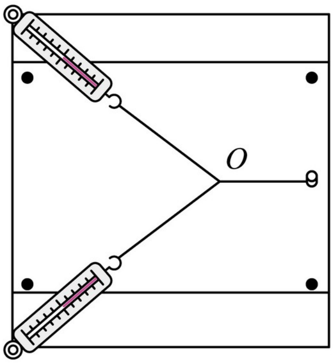


图4

□2□“□□□□□□□□”□□□□□□ 4 □□□□□□□□

① □□□□□□□______□

A□□□□□□□□□□□□□□□□□□□

B□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

C□□□□□□□□□□□□□□□□□□

D□□□□□□□□□□□□□□□□□□□□□□

② □□□□□□□□□□□□□□□□□□______□□□“2”□“3”□“4”□□□□□□□□□ O□

□□□□ ①. 6.15~6.25 ②. 1.7 ~2.1 ③. BC##CB ④. D ⑤. 3

□□□□

□□□□□1□[1]□□□□□□□ B □□□□□□□ 6.20cm□□□□□□□□6.15cm~6.25cm □□□

[2] □□3 □□□□□□□□□□□

$$a=\frac{\Delta v}{\Delta t}=\frac{1.05-0.30}{0.4}\mathrm{m/s^2}=1.9\mathrm{m/s^2}$$

□□□□□□□□1.7m/s²~2.1 m/s² □□□

[3] A□□□□ 1 □□“□□□□□□□□□□□□□□”□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□A □

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B□□□□ 1 □□“□□□□□□□□□□□□□□”□□

□□□□□□□□□□□□□ B □□□

C□□□□□□□□□□□□□□“□□□□□□□□□□□□□□□”□□□□

$$1.9\mathrm{m/s^2}\approx\frac{mg-f}{M+m}$$

□□□□□□□□□ $f \ll mg$ □□

$$1.9\mathrm{m/s^2} \approx \frac{mg}{M+m}$$

□□□

$$M \approx 4m$$

□□□□ 1 □□“□□□□□□□□□□□□□”□□□□□□□□□□□□□□□□□□□□□ $m \ll M$ □□□□□□□□□□□□□□□□

□□□□□□“□□□□□□□□□□□□□”□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ C □□□

D□□ D □□□

□□ BC□

□2□[4] A□□ A □□□

B□□ B □□□

C□□□ C □□□

D□□ D □□□

□□ D□

[5] □□□ O □□□□□ O □□□□□□ F_1 □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ O □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ F_2 □□□□□□□□□□□□□ O □□□□□□□□□□□□□ F □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ 3 □□□□□□□□□ O□

18. □1□□□□□□□□□□□□□□□□□ 1 □□□□□□□□□□ P □ A □□ B □□□□□□□□□ R □□□□□□□□

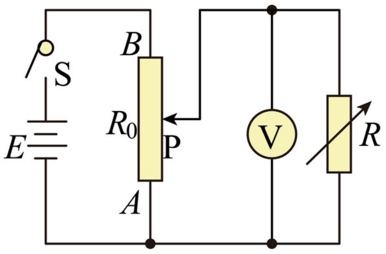


图1

① □2□□□□□□□□□□□□□□______□□□ af□bf□fd□fc□ce □ cg□□□□

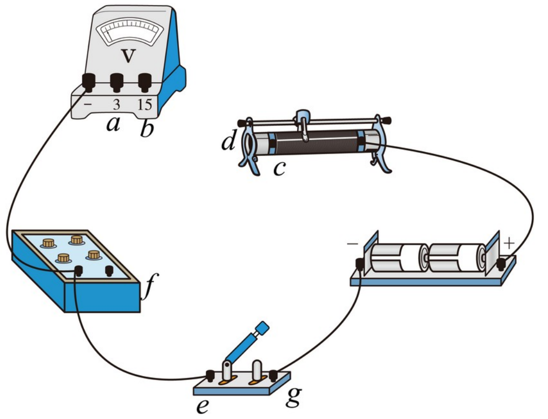


图2

②□3 □□□□□□□□□□________ V□

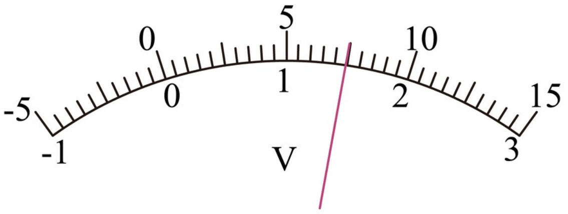


图3

③□□□□□□□□□□□□□R_0=10Ω□□□□□I=1.0A□□□□□□□R=10Ω□□R□□□□U□□□□□$\frac{x}{L}$□□

□x□AP□□□□L□AB□□□□□□□ U - $\frac{x}{L}$ □□□□□□□□4□□“I”□□R=100Ω□□□□□□□□□□4□

□__□□□“Ⅱ”□“Ⅲ”□□□□□□□□□□□□□□□□□□□□____□

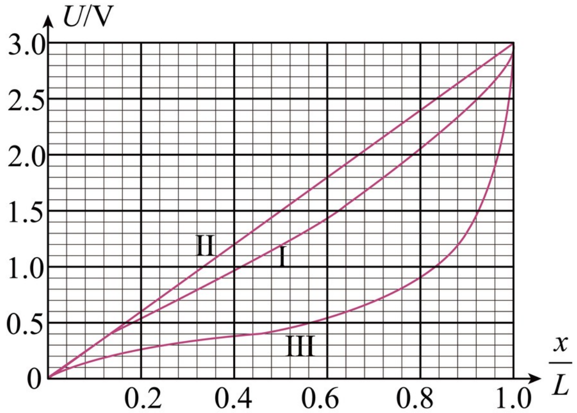


图4

□2□□□□□□□□□ G_1 □ G_2 □□ 5 □□□□□□□ G_1 □□□□□□□□□□□□□□□ G_2 □□□□□□□□□□□□□□____□

A□□□□□“□□□”

B□G_1□□“□□□”□ G_2□□“□□□”

C□G_1□□ G_2□□□□□□□□□

D□G_1□□□□□□□□ G_2□□□□□□□□□ G_2□□□□□

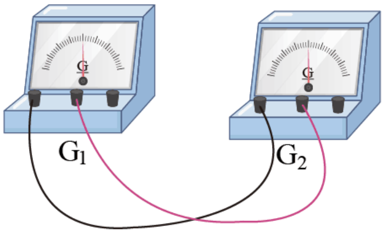


图5

□□□□　①. af□fd□ce　②. 1.50 ± 0.02　③. Ⅱ　④. $R_0 < R$　⑤. BD##DB

□□□□

□□□□1□[1]□□□□□□□□□□ af□fd□ce □□□

[2]□□□□□□□□□□□□□ 1.50V□□□□□□□□ $(1.50\pm0.02)\text{V}$ □□□

[3] □□ AP □□□□□□ R □ R □□□ 10Ω □ 100Ω □□□□ BP □□□□□□□□□□□□□ R □ 100Ω □□□□

□□□□ 10Ω □□

□□□ 100Ω □□□□□□□□□□□□□□□ 4 □□“I”□□□□□□□□“Ⅱ”□

[4]□□

□□

□□ $R_0 < R$□

□2□[5]□□□□□□□□□□□□□□□□□□□□□□□□□□□□G_1□ G_2□□□□□□□□□□□□□ G_1□□□□□ G_1□□□□□

□□ G_2□□□□□□□□□□□□□□□□□□□□□□□□□□□

□□□□□□□G_2□□□□□□□□□ G_1□□□□“□□□”□G_2□□□□“□□□”□□AC□□□BD□□□

□□BD□

19. □□24°□□□□ $l_1 = 4\text{m}$□□□□□□□□□□□□□□□□□

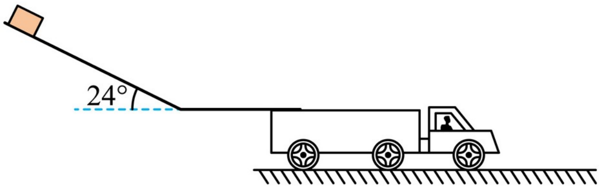
□□ $m = \frac{2}{9}$□□□□□□□□□□ $\cos 24^\circ = 0.9$□

$\sin 24^\circ = 0.4$□□□□□□ $g = 10\text{m/s}^2$□□

□1□□□□□□□□□□□□□□□□□ a_1□□□□

□2□□□□□□□□□□□□□□□□□ v□□□□

□3□□□□□□□□□□□□□□□□□□□□□2m/s□□□□□□□□□□□□ l_2□



□□□□□1□ 2m/s^2 □□2□ 4m/s□□3□ 2.7m

□□□□

□□□□□1□□□□□□□□□□□

$$mg\sin 24^\circ - \mu mg\cos 24^\circ = ma_1$$

□□□□□□

$$a_1 = 2\text{m/s}^2$$

□2□□□□□□□□

$$2a_1 l_1 = v^2$$

□□

$$v = 4\text{m/s}$$

□3□□□□□□□□□

$$\mu mg = ma_2$$

□□□□□□□

$$-2a_2 l_2 = v_{max}^2 - v^2$$

□□□□□□□□

$$l_2 = 2.7\text{m}$$

20. □□□□□□□□□□□□□□ m □□□ a □□□□□ O □□□□ A □□□□□ v □□□□□□□□□ MN □□□□ AB□CD□FG □□□□□□□□□ AB□MN□CD □□□□□ l □□□□□□□ DE □□□ R□EF □□□□□□□ E □□□□ H □□□□□□□□ a □□□□□ b □□□ O □□□□□□□□□□□□ h □□□□□□□□□□□□□□□□□□□□□□ a □□□□

□□□□□ $m = 2\text{g}$□ $l = 1\text{m}$□ $R = 0.4\text{m}$□ $H = 0.2\text{m}$□ $v = 2\text{m/s}$□□□□ MN□CD □□□□□□□□

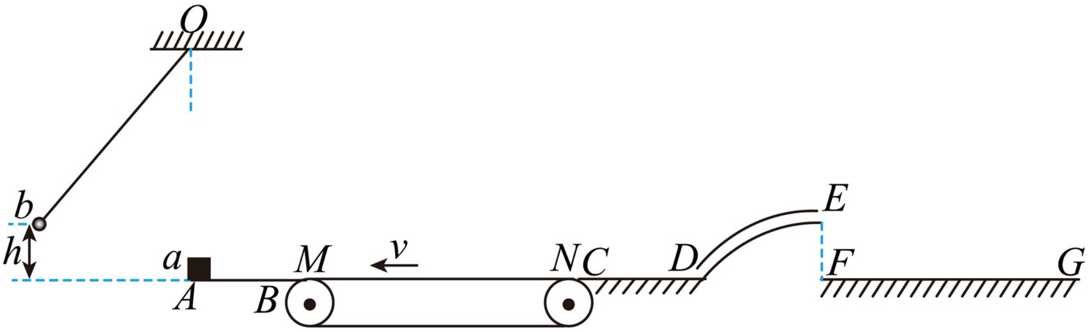
$\mu = 0.5$ □□□ AB □□□ DE □□□□□□ a □□ FG □□□□□□□□□□ M□B□N□C□□□□□□CD□DE□

□□□□□□□□□□□□□ $g = 10\text{m/s}^2$ □

□1□□ $h = 1.25\text{m}$ □□ a□b □□□□□□□ a □□□ v_0 □□□□

□2□□□ a □ DE □□□□□□□□□□□□□□□ F_N □ h □□□□□□□

□3□□□□ b □□□□ $0.9\text{m} < h < 1.65\text{m}$ □□□□ a □□□□□□□ x □□□□□□ A □□□□□□□□□□□□□□□□□□□ x □□□



□□□□□1□ 5m/s□□2□ $F_N' = 0.1h - 0.14(h \ge 1.2\text{m})$□□3□□ $0.9\text{m} < h < 1.2\text{m}$□□

$2.6\text{m} \le x \le 3\text{m}$ □□ $1.2\text{m} \le h < 1.65\text{m}$ □□ $\left(3+\frac{\sqrt{3}}{5}\right)\text{m} \le x < \left(3.6+\frac{\sqrt{3}}{5}\right)\text{m}$

□□□□

□□□□□1□□□ b □□□□□□□□□□□□□□□□□□□

$$mgh = \frac{1}{2}mv_b^2$$

□□

$$v_b = 5\text{m/s}$$

b □ a □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

$$mv_b = mv_b' + mv_0$$

$$\frac{1}{2}mv_b^2 = \frac{1}{2}mv_b'^2 + \frac{1}{2}mv_0^2$$

□□□□

$$v_0 = v_b = 5\text{m/s}$$

□2□□□1□□□□□□□ b □□□ a □A□□□□□□□□□□□□□□□□ a □□□□□□ E □□□□□ h_1 □□□□□□□□□

$$mgh_1 - 2\mu mgl - mgH = 0$$

□□

$$h_1=1.2\text{m}$$

□□□□□□□□□

$$F_{\text{N}}+mg=m\frac{v_E^2}{R}$$

□□□□□

$$mgh-2\mu mgl-mgH=\frac{1}{2}mv_E^2$$

□□□□

$$F_{\text{N}}=0.1h-0.14(h\geq 1.2\text{m})$$

□3□□ $1.2\text{m}\leq h<1.65\text{m}$ □□□□□□□ E □□ E □□□□□□□□□□□

$$mgh-2\mu mgl-mgH=\frac{1}{2}mv_E^2$$

□ E □□□□□□□□□

$$H=\frac{1}{2}gt^2$$

□□□□

$$s=v_Et$$

□□□□□□□□

$$DF=\frac{\sqrt{3}}{5}\text{m}$$

□□□□

$$x=3l+DF+s_1$$

□□□□□□

$$\left(3+\frac{\sqrt{3}}{5}\right)\text{m}\leq x<\left(3.6+\frac{\sqrt{3}}{5}\right)\text{m}$$

□ $0.9\text{m}<h<1.2\text{m}$ □□□ $h_2=0.9\text{m}$ □□□□□□□□□□□□

$$mgh-\mu mgs_2=0$$

[illegible]

$$s_2=1.8\text{m}$$

[illegible] C [illegible] 0.8m [illegible] a [illegible] E [illegible] CD [illegible]

$$mgH-\mu mgs_3=0$$

[illegible]

$$s_3=0.4\text{m}$$

[illegible] C [illegible] 0.6m [illegible] $0.9\text{m}<h<1.2\text{m}$ [illegible]

$$3l-s_3\le x\le 3l$$

[illegible]

$$2.6\text{m}\le x\le 3\text{m}$$

21. [illegible] 1 [illegible]

[illegible]

[illegible] B [illegible] S [illegible] 1 [illegible] S [illegible]

2 [illegible] R_0 [illegible] F [illegible] F [illegible] v-t [illegible] 2

[illegible] t_1 [illegible] t_3 [illegible] F=(800[illegible]10v[illegible]N[illegible]t_3 [illegible] F [illegible] v_1=80m/s[illegible]t_1=1.5s[illegible] n=100

[illegible] l=1m[illegible] M=10kg[illegible] m=5kg[illegible]R_0=9.5Ω[illegible]B=0.1T[illegible]

[illegible]

[illegible]1[illegible] I[illegible]

[illegible]2[illegible] R[illegible]

[illegible]3[illegible] t_3[illegible]

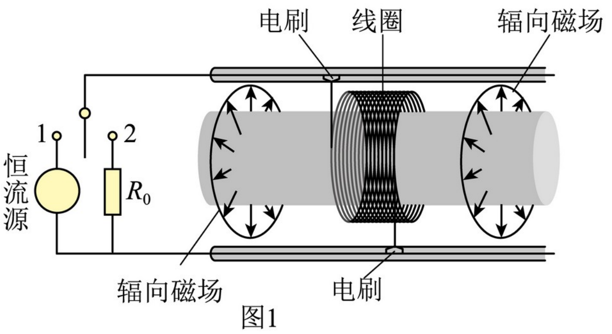


图1

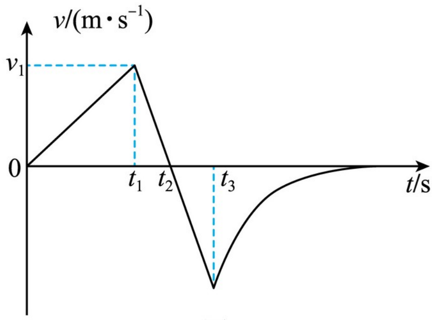


图2

[illegible]（1）80A；（2）$R=0.5\Omega$；（3）$t_3=\frac{\sqrt{5}+3}{2}s$

[illegible]

[illegible]（1）[illegible]

$$F_{[illegible]}=nBIl$$

[illegible] $0\sim t_1$ [illegible]

$$a=\frac{v_1}{t_1}$$

[illegible]

$$F_{[illegible]}=(M+m)a$$

[illegible]

$$I=\frac{(m+M)v_1}{nlBt_1}=80A$$

（2）[illegible] S [illegible] 2 [illegible] R_0 [illegible]

$$I'=\frac{nBlv}{R_0+R}$$

[illegible]

$$F'_{[illegible]}=nBI'l$$

[illegible]

$$(800-10v)+\frac{n^2l^2B^2}{R_0+R}v=ma'$$

□□□□□ t_1 □ t_3 □□□□□□□□□□

$$\frac{n^2l^2B^2}{R_0+R}=10$$

□□

$$R=0.5\Omega \text{□} a'=160\text{m/s}^2$$

□3□□□□□□□

$$t_2-t_1=\frac{v_1}{a'}=0.5\text{s}$$

□ $t_2=2\text{s}$ □□ $0\sim t_2$ □□□□□□□

$$s=\frac{1}{2}v_1t_2=80\text{m}$$

□□□□□□□□□□□□□

$$E=n\frac{\Delta\phi}{\Delta t}=\frac{nB\Delta S}{\Delta t}$$

□□□□□□□

$$\Delta q=It$$

$$I=\frac{E}{R+R_0}$$

□□

$$\Delta q=\frac{nBl\left[s-\frac{1}{2}a'(t_3-t_2)^2\right]}{R+R_0}$$

□ t_3 □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

$$-nBl\Delta q=0-ma'(t_3-t_2)$$

□□□□

$$(t_3 - t_2)^2 + (t_3 - t_2) - 1 = 0$$

□□

$$t_3 = \frac{\sqrt{5}+3}{2}\text{s}$$

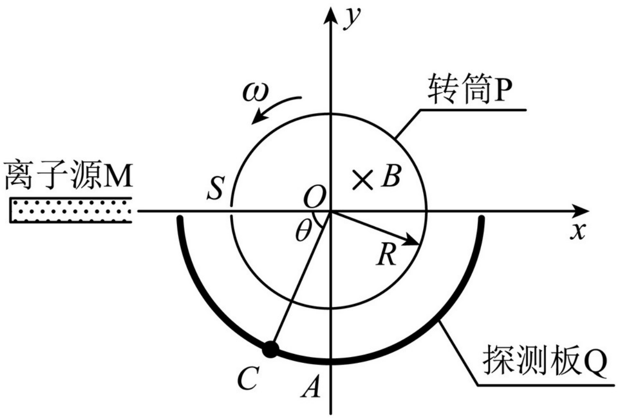
22. □□□□□□□□□□□□□□□□□□□□□R□□□□□□P□□□□O□□□□xOy□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□S□□Q□□Q□y□□□A□□□□□□M□□□x□□□□□□□m□□□□□□$-q$□$q>0$□□□□□□□□□□□□□□□□□□□□□□v_0□□□□□□□□□□□□□□□□□□□□y□□□

□1□①□□□□□□□B□□□□□

② □□□□□□□v_0□□□□□□□Q□□A□□□□□□P□□□ω□□□□□

□2□□□□□□□□□□□P□□□□□□N□□□□□□□Q□C□□OC□x□□□□□□□□□θ□□□□□□□□□□□□□□□C□□□□□□□□F□□□□□

□3□□□□□P□□□□□□□$\frac{6v_0}{R}$□□A□□□□□□□□□□□Q□□□□□□□□□□□□θ'□□□□□□□□□□□□O□□□□x□□□□□□□□□□



□ □ □ □□1□① $B=\frac{mv_0}{qR}$□② $\omega=(4k+1)\frac{v_0}{R}$□$k=0$□1□2□3…□□2□

$$F=\frac{(2n\pi+\theta)N}{2(\pi-\theta)\pi}\frac{mv_0^2}{R}\tan\frac{\theta}{2}$$□$n=0$□1□2□…□□3□$\theta'=\frac{5}{6}\pi$□$\frac{1}{6}\pi$

□□□□

□□□□□1□①□□□□□□□□□□□□

$$qv_0B=\frac{mv_0^2}{R}$$

□

$$B=\frac{mv_0}{qR}$$

② □□□□□□□□□□□

$$t=\frac{\pi R}{2v_0}$$

□□□□□□□

$$\omega t=2k\pi+\frac{\pi}{2}$$

$$\omega=(4k+1)\frac{v_0}{R}□k=0□1□2□3\ldots$$

□2□□□□□□v□□□□□□□□□□□□□□R'□□

$$R'=R\tan\frac{\theta}{2}$$

$$v=v_0\tan\frac{\theta}{2}$$

□□□□□□□□□□□

$$t'=(\pi-\theta)\frac{R}{v_0}$$

□□□□□□□

$$\omega' t'=2n\pi+\theta$$

□□□□□□□□

$$\omega'=\frac{(2n\pi+\theta)}{(\pi-\theta)}\frac{v_0}{R}□n=0□1□2□\ldots$$

□□□□

$$F\frac{2\pi}{\omega'} = Nmv$$

$$F = \frac{(2n\pi + \theta)N}{2(\pi - \theta)\pi}\frac{mv_0^2}{R}\tan\frac{\theta}{2} \text{□} n = 0\text{□}1\text{□}2\text{□}\ldots$$

□3□□□□□□□□□

$$\frac{(4k+1)v_0}{R} = \frac{(2n\pi + \theta')v_0}{(\pi - \theta')R} < \frac{6v_0}{R}$$

□□

$$k = 1\text{□}\theta' = \frac{5-2n}{6}\pi\text{□}n = 0\text{□}2$$

□□

$$\theta' = \frac{5}{6}\pi \text{ □ } \frac{1}{6}\pi$$